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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,673	06/22/2006	Toshiyuki Inagaki	128357	5009

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OLIFF & BERRIDGE, PLC
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ALEXANDRIA, VA 22320-4850

EXAMINER

KWON, ASHLEY M

ART UNIT	PAPER NUMBER
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1795

NOTIFICATION DATE	DELIVERY MODE
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05/03/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/582,673	Applicant(s) INAGAKI, TOSHIYUKI	
	Examiner ASHLEY KWON	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 27-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

In response to the amendment received April 21, 2010:

- a. Claims 27-39 are pending;
- b. In light of the Applicant's arguments filed 4/21/2010, the finality of the Previous Office Action mailed on 2/2/2010 is withdrawn. Therefore the following Office Action is non-final.

Claim Objections

Claim 27 is objected to because of the following informalities: Applicant is advise to write out the acronym "MEA" the first time it is used so that it is clear what applicant is referring to. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 27-39 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 27 recites an adhesive layer with a Young's modulus within the range

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of 30 MPa to 100 MPa. The specification fails to describe any materials or method of making said adhesive layer with a Young's modulus within the range of 30 MPa to 100 MPa. Further, it is unknown whether the adhesive layer as claimed can be used in any type of fuel cell stack. Applicant fails to claim a specific material for an electrolyte membrane, catalyst, and diffusion layer. The specification does not enable any person skilled in the art to make and use the invention commensurate in scope with these claims.

Case law holds that applicant's specification must be "commensurately enabling [regarding the scope of the claims]" *Ex Parte Kung*, 17 USPQ2d 1545, 1457 (Bd. Pat. App. Inter. 1989). Otherwise **undue experimentation** would be involved in determining how to practice and use applicant's invention. It has been interpreted to require that the claimed invention be enabled so that any person skilled in the art can make and use the invention without undue experimentation as stated in the test for undue experimentation in *Ex parte Forman*, 230 USPQ 546, 547 (Bd. Pat. App. Inter. 1986) and in *In re Wands*, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). Upon applying this test to claims 27-39, it is believed that undue experimentation **would** be required because:

(a) *The quantity of experimentation necessary* is **great** since claims 27-39 read on any type of fuel cell stack, with any separator, electrolyte membrane, catalyst, diffusion layer, and adhesive layer with a Young's modulus within the range of 30 MPa to 100 MPa.

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(b) There is **no direction or guidance presented** for a specific material or method of making for the adhesive layer with a Young's modulus within the range of 30 MPa to 100 MPa.

(c) There is an **absence of working examples** concerning the composition of the adhesive layer.

In light of the above factors, it is seen that undue experimentation would be necessary to make and use the invention of claims 27-39.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

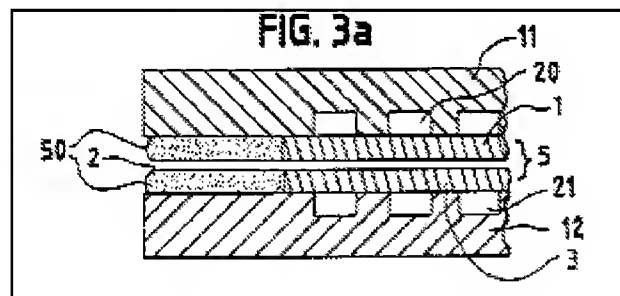
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 27-30 and 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,080,503 (hereinafter "Schmid") in light of Araldite® 2018 Technical Data Sheet (hereinafter "Araldite").

Regarding claim 27, Schmid discloses a fuel cell stack (see fig. 1) comprising: a pair of separators (11, 12); an MEA (5) in which an electrolyte membrane (2), a catalyst layer, and a diffusion layer (electrode layers 1, and 3) are laminated (see col. 1, lines 21-33), and which is provided between the pair of the separators; and an adhesive layer (50) provided between the pair of the separators, which contacts at least an end of the electrolyte membrane, an end of the catalyst layer and an end of the diffusion layer (see fig. 3a). Schmid discloses two possible MEA configurations, one where the membrane extends beyond the electrodes, and another where the membrane is coextensive with the electrodes (see col. 6 line 61 – col. 7, line 5). In both configurations the adhesive layer would contact at least an end of the membrane, catalyst layer, and diffusion layer.



Schmid fails to explicitly disclose a fuel cell stack wherein the adhesive layer has a Young's modulus of at most within the range of 30 MPa to 100 MPa.

However Schmid does disclose that PUR, such as, for example Araldite 2018 is suitable for use in his invention (see col. 5, lines 43-44). Araldite 2018 has a tensile modulus (also known as Young's Modulus) of 16 MPa (see Araldite pg 3/5). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established

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when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Schmid's disclosure of Araldite 2018, which has a tensile modulus of 16 MPa, and applicants' claimed Young's Modulus of 30 MPa are not significantly different from each other. It is noted that Applicant teaches away from a conventional adhesive layer with a Young's Modulus of greater than 100 MPa ([0051] if instant specification). Schmid's invention clearly is able to utilize a softer adhesive with a tensile modulus of 16 MPa. Therefore the burden is upon Applicant to prove unexpected results within the claimed range.

Regarding claim 28, Schmid discloses the fuel cell stack according to claim 27, wherein; the electrolyte membrane has an extended portion which extends beyond the end of the catalyst layer and the end of diffusion layer (*Schmid*: see col. 6, lines 61-67), and a portion of the adhesive layer is provided between the extended portion of the electrolyte membrane and one of the pair of separators so as to contact a surface of the extended portion, and another portion of the adhesive layer is provided between the extended portion of the electrolyte membrane and another of the pair of separators so as to contact another surface of the extended portion (*Schmid*: see fig. 3a). Schmid discloses that the catalyst layer is provided at the interface between electrode layer and the PEM layer (see col. 1, lines 26-30). Therefore, if the PEM is extended beyond the electrode layer, then it also would be extended beyond the catalyst layer as well.

Regarding claim 29, Schmid discloses the fuel cell stack according to claim 27, wherein; a portion of the adhesive layer is provided between one of the pair of the separators and the catalyst layer so as to contact a surface of the catalyst layer; and

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another portion of the adhesive layer is provided between another of the pair of the separators and the diffusion layer so as to contact a surface of the diffusion layer.

Schmid clearly shows in fig. 3a that the adhesive layer (50) contacts a surface of the diffusion layer. Although the catalyst layer is not shown in fig. 3a, Schmid discloses that the catalyst layer is located at the interface between the electrode (diffusion layer) and PEM layer (see col. 1, lines 25-30). Therefore the adhesive layer would necessarily contact a surface of the catalyst layer as well.

Regarding claim 30, Schmid discloses the fuel cell stack according to claims 27, wherein: the Young's modulus of the adhesive layer is within a range of 50 MPa to 30MPa (see arguments above for claim 27).

Regarding claim 35, Schmid discloses the fuel cell stack according to claim 27, wherein multiple cells, each of which is formed by interposing the MEA between the pair of separators, are linearly arranged in a cell stacking direction, and the fuel cell stack further comprises an adhesive layer sandwiched between two cells adjacent to each other (*Schmid*: see col. 4, lines 32-34, see fig. 5b).

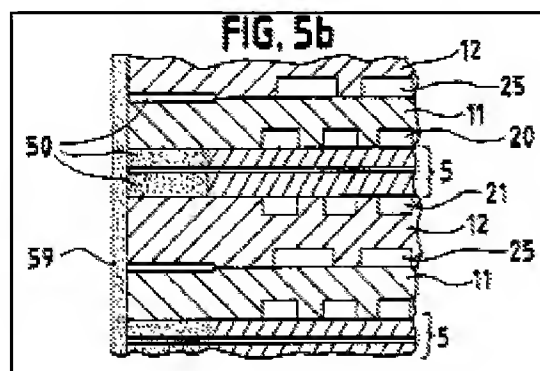
Regarding claim 36, Schmid discloses the fuel cell stack according to claim 27, wherein multiple cells, each of which is formed by interposing the MEA between the pair of separators, are linearly arranged in a cell stacking direction, and a bead gasket is provided as a seal between two of the multiple cells, which are adjacent to each other, and a separator of the two of the multiple cells which contacts the bead gasket has a greater planar rigidity than a separator of another cells which does not contact the bead gasket. Schmid discloses that some of all the cells in the stack may be adhesively

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bonded together, and stack components such as end plates may also be adhesively bonded to adjacent components if so desired (see col. 4, lines 31-41). The adhesive layer disclosed by Schmid acts as a bead gasket. The term "bead gasket" does not limit the adhesive to any shape, and this claim is met as long as it provides a seal between multiple cells. It is obvious that cells which contact the bead gasket would have greater planar rigidity than a separator of another cell which does not contact the bead gasket because the bead gasket provides an extra adhesive bond.

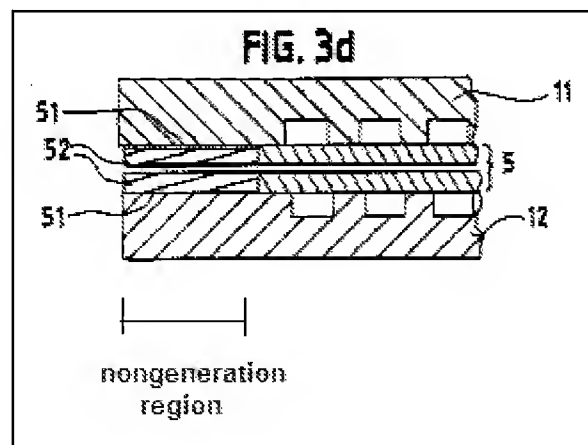
Regarding claim 37, Schmid discloses the fuel cell stack structure according to claim 36, further comprising a generally flat plate which is placed on the separator which contacts the bead gasket to increase the planar rigidity of the separator. Schmid discloses that a flat plate (end plate) may be adhesively bonded to adjacent components, which would be the separator (see col. 4, lines 38-41).

Regarding claim 38, Schmid discloses the fuel cell stack according to claim 27, wherein the adhesive layer is provided between the separators in an entire non-power generation region (*Schmid*: see fig. 3a, see col. 4, lines 2-6).



Claims 27 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid as evidenced by Araldite.

Regarding claim 27, Schmid discloses a fuel cell stack (see fig. 1) comprising: a pair of separators (11, 12); an MEA (5) in which an electrolyte membrane (2), a catalyst layer, and a diffusion layer (electrode layers 1, and 3) are laminated (see col. 1, lines 21-33), and which is provided between the pair of the separators; and an adhesive layer (52) provided between the pair of the separators, which contacts at least an end of the electrolyte membrane, an end of the catalyst layer and an end of the diffusion layer (see fig. 3d). Schmid discloses two possible MEA configurations, one where the membrane extends beyond the electrodes, and another where the membrane is coextensive with the electrodes (see col. 6 line 61 – col. 7, line 5). In both configurations the adhesive layer would contact at least an end of the membrane, catalyst layer, and diffusion layer.



Schmid fails to disclose a fuel cell stack wherein the adhesive layer has a Young's modulus of at most within the range of 30 MPa to 100 MPa.

However Schmid does disclose that PUR, such as, for example Araldite 2018 is suitable for use in his invention (see col. 5, lines 43-44). Araldite 2018 has a tensile

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modulus (also known as Young's Modulus) of 16 MPa (see Araldite pg 3/5). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Schmid's disclosure of Araldite 2018, which has a tensile modulus of 16 MPa, and applicants' claimed Young's Modulus of 30 MPa are not significantly different from each other. It is noted that Applicant teaches away from a conventional adhesive layer with a Young's Modulus of greater than 100 MPa ([0051] if instant specification). Schmid's invention clearly is able to utilize a softer adhesive with a tensile modulus of 16 MPa. Therefore the burden is upon Applicant to prove unexpected results within the claimed range.

Regarding claim 32, Schmid discloses the fuel cell stack according to claim 27, wherein a rigid spacer (51) is provided in the adhesive layer (52) (*Schmid*: see fig. 3d). Barring specification as to the composition of the rigid spacer, an adhesive film made of epoxy, a known hard substance, will be interpreted as meeting the claim (see col. 7, lines 62-63; col. 5, lines 35-40).

Regarding claim 33, Schmid discloses the fuel cell stack according to claim 32, wherein the rigid spacer (51) is provided in the adhesive layer (52) throughout a non-generation region (see annotated fig. 3d).

Regarding claim 34, Schmid fails to explicitly disclose the fuel cell stack according to claim 32, wherein the adhesive layer has a thickness that allows the

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adhesive layer to have a Young's modulus of at most 100 MPa with the rigid spacer provided in the adhesive layer.

However, as explained above for claim 27, it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Schmid's invention clearly is able to utilize a softer adhesive with a tensile modulus of 16 MPa. Therefore the burden is upon Applicant to prove unexpected results within the claimed range.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid as evidenced by Araldite as applied to claim 27 above, and further in view of Uchida et al. (US Pat. No. 6,316,139) (hereinafter "Uchida").

Regarding claim 31, Schmid fails to disclose the fuel cell stack structure according to claims 27, wherein; the adhesive layer has a thickness of 50 μm to 150 μm .

However, Uchida teaches a fuel cell having a gasket with an adhesive layer, wherein the adhesive layer has a thickness of preferably 10-300 μm . Uchida also teaches that the adhesive layer needs to be thick enough to achieve insulation and sealing between adjacent separators while absorbing the thickness of the ion exchange membrane, therefore proving that it is a result effective variable (see col. 4, lines 4-8). The discovery of an optimum value of a known result effective variable, without

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producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.). Therefore it would have been obvious to a person of ordinary skill in the art to optimize the thickness taught by Uchida.

Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid as evidenced by Araldite as applied to claim 27 above, and further in view of Mizuno (US Pat Pub. 2001/0049074) (hereinafter "Mizuno").

Regarding claim 39, Schmid fails to disclose the fuel cell stack according to claim 27, wherein the adhesive layer contains rigid beads each of which has a diameter equal to or smaller than a thickness of the adhesive layer.

However, Mizuno teaches a fuel cell having a gasket with an adhesive layer, wherein the adhesive layer contains resin beads of a predetermined diameter in order to regulate the thickness of the adhesive layer (see paragraphs 22 and 57). Since the resin beads regulate the thickness of the adhesive layer, it is obvious that the resin beads would have a diameter equal to or smaller than the thickness of the adhesive layer. The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, A.). Therefore, it would have been obvious to a person of ordinary skill in the art to combine the resin beads taught by Mizuno with the adhesive layer taught by Schmid in order to regulate the thickness of the adhesive layer.

Response to Arguments

Applicant's arguments with respect to claims 27-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHLEY KWON whose telephone number is (571)270-7865. The examiner can normally be reached on Monday to Thursday 7:30 - 6 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/ASHLEY KWON/

Examiner, Art Unit 1795

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795